NEST ROBBING AND FOOD STORING BY NEW ZEALAND FALCONS *(Falco novaeseelandiae)*

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Abstract

New Zealand Falcons at hack (i.e., controlled liberty) or in the wild were seen attempting to rob nests or to capture fledging young on at least 11 occasions. Food storage or retrieval was seen in numerous instances in 8 captive or semicaptive falcons and 13 wild pairs. Common situations in which these behaviors were seen are outlined, and the significance of food storage in raptors is discussed.

Introduction

Nest robbing and retrieving of stored food are similar activities which are often difficult to distinguish between in the field. Nest robbing has been seen in the American Kestrel *(Falco sparverius)* by Bonnot (1921), Bishop (1925), Drinkwater (1953), and Richards (1967); in Lanner Falcon *(Falco biarmicus)* by Sinclair and Walters (1976); and in Peregrine Falcon *(Falco peregrinus)* by Clunie (1976). Nest robbing has also been seen in accipiters such as the Coopers Hawk *(Accipiter cooperii)* (Linduska 1943, Nelson 1968), the Northern Goshawk *(Accipiter gentilis atricapillus)* (Schnell 1958), the Gabar Goshawk *(Melierax gabar)* (Kruuk and Voous 1966, Kluyver 1966) and the Pale Chanting Goshawk *(Melierax canorus)* (Smeenk and Smeenk-Enserink 1976). Lowe (1940) recorded the African Harrier Hawk *(Polyboroides typus)* as killing nestling birds. This latter is more fully docmented by T. Thurow (ms and pers. comm.).

Henry (1903) was the first to mention nest robbing in the New Zealand Falcon *(Falco novaeseelandiae)*. He wrote: "The hawk used to fly through the trees where the nest were, and seldom failed to carry something off in his claws." He did not specify whether the prey was adult or young.

Field Observations

New Zealand Falcons were seen attempting to rob nests on 5 occasions. On 4 occasions an adult male nesting at hack attempted to enter Starling *(Sturnus vulgaris)* nests in tree hollows or in holes between bales of hay. Each time he flew directly to the hole and, clinging to the rim, tried to pull the young out with his beak, but was unsuccessful. Prey remains indicated that he managed to take several young starlings as they left the nest and started to fly. On another occasion a different adult male at hack detected an occupied House Sparrow *(Passer domesticus)* nest by the cheeping of the chicks. The nest was in the rafters of an open tractor shed. The falcon flew up, clinging to the beam, pulled the nest open, and extracted one of the young sparrows. On another occasion a pair of feral Rock Dove (*Columba livia*) were nesting in the rafters of an open barn, inaccessible to ground predators. The day after the eggs hatched, the squabs disappeared. Although the falcon was not seen to take the young, he regularly roosted in

the rafters only 3 m from the nest, and the pigeons reared young successfully once he was removed.

Wild New Zealand Falcons were not seen actually robbing a nest although remains of young nestlings, some still naked, were found at several eyries (Fox 1977: 90).

Although not actual nest robbing, on one occasion a wild adult male systematically caught and ferried away a brood of Yellowhammer *(Emberiza citrinella)* which had just left the nest. As in the Goshawk described by Schnell (1958), the falcon returned to the raided nest area until no more young were found. Also on 5 occasions falcons at hack in my study penetrated deep into hedges and bushes to capture newly fledged young birds, ignoring the scolding parents only a few centimeters away.

Food Caching

Although food caching has been recorded in the accipiters (Selous 1911, Owen 1931, Schnell 1958), in a Ferruginous Hawk *(Buteo regalis)* (Angel 1969), and in a Crowned Eagle *(Stephanoaetus coronatus)* (Brown 1971), reports of hiding prey are more common for owls and falcons. Kaufman (1973) and Collins (1976) recorded food caching in a number of owl species. Townsend (1930), Pierce (1937), Tordoff (1955), Stendall and Waian (1968), Mueller (1974), and Balgooyen (1976) noted food hiding in American Kestrel; Greaves (1968) and Oliphant and Thompson (1976), in the Merlin *(Falco columbarius)*; Vaughan (1961), in Eleanora's Falcon *(Falco eleanorae)*; Beebe (1950), in Bat Falcon *(Falco rufigularis)*; Peterson and Sitter (1975), in Prairie Falcon *(Falco mexicanus)*; and Beebe (1960) and R. W. Nelson (pers. comm.), in Peregrine Falcon.

New Zealand Falcons showed a marked tendency to cache prey at all times of the year. Eight falcons studied in captivity or at hack all had a strong caching habit. It was so marked that, after a trained falcon had killed prey, it would usually hide it and continue hunting. This was in normally keen hunting birds and was contrary to expectations (see Mueller 1973). One falcon caught, killed, and hid five House Sparrows in a row without eating any of them. Food storage was frequent in the wild too; at least 13 wild pairs of falcons were seen hiding or retrieving cached food (fig. 1).

New Zealand Falcons hid prey in much the same way as described for other species. The site was approached furtively, and the prey thrust into place with the beak. Items apparently were not placed in any preferential position such as belly-downwards, as described by Tordoff (1955) and Balgooyen (1976). After positioning the item, the falcon would then run a few steps and examine the site as if inspecting or memorizing the location (Mueller 1974). If not satisfied the falcon occasionally would extract the prey and adjust it or hide it somewhere else. The commonest locations for caches were small (30–100 cm high) bushes, the prey being thrust in from above or from the side. Tussocks, tree-stumps, and small (3–4 m) trees were also used. Taller trees were also used regularly where available. Some of the bushes were too dense and thorny for me to insert my hand, and yet I saw the falcons squeeze in right out of sight.

The length of time each prey was stored was not determined, but overnight storage was frequent. One item was retreived 10 days later by a hack falcon. Only one item was ever seen in one cache at any one time, but the same tree or bush was sometimes used repeatedly, on an irreglar basis. Although a particular falcon usually retrieved only from its own store, during courtship the female often raided the male's caches—an activity known as "remote food passing" (Nelson 1977, Fox 1978).

The commonest situations in which caching occurred were:

a. If an adult male returned to the nest area with prey and met with no response from the female, he usually hid the prey.
b. If the female had fed chicks and herself and still had some food left over, she cached it 20–100 m from the nest.
c. If the male had been hunting and returned unsuccessful, he might then extract stored prey to give to the female.
d. If the male returned to the nest with prey and saw an intruder, he would retire and hide the food before commencing nest defense (see Schnell 1958).
e. If several vulnerable prey were found, the falcon would kill one and cache it, then return for the others, one by one.
f. Remote food passing.

Falcons usually approached the cache directly when retrieving food. But on at least 8 occasions falcons landed within 5 m of the food and spent up to 7 min. searching for the location. The falcons' imprecise knowledge may have been because a different falcon had originally stored the food while the retrieving falcon had watched from some distance away, or because the falcon had stored the food there some time before and all the bushes looked similar. Also, in the field it was difficult to detect whether the food was retrieved and previously killed food or freshly killed from a raided nest (a "living food cache"). Falcons at hack appeared aware of the nesting activities of other birds and checked nest bushes with persistent regularity.

The Significance of Food Caching

Caching appears to take place only when food is abundant. I have found no records of food storing when prey was scarce. C. M. White (pers. comm.) described how a migrating American Kestrel repeatedly killed migrating Kinglets (*Regulus* sp.) and hid them, moving on at the end of the day having stored 7 Kinglets with no obvious intention of returning. Sea-cliff nesting Peregrines, preying on sea-bird colonies, often store excess prey during the breeding season. All my observations of food caching in New Zealand Falcons have been of birds with a secure food supply. Even trained birds seemed to be aware that they would be fed whether they killed or not.

Food storage may make use of prey which is temporarily abundant or available to tide over periods when prey is less available. R. W. Nelson (pers. comm.) noted that Peregrines *(F.p. pealei)* nesting near colonies of the Ancient Murrelet *(Synthliboramphus antiquum)* appeared to live entirely on cached prey. The male was presumably killing the murrelets as they left the colony at dawn and then caching them for daytime use when the murrelets were away at sea.

New Zealand Falcons became lethargic during the oppressive midday summer heat and appeared reluctant to hunt. Active flapping flight, especially carrying prey, was reduced at this time, and cached prey were often used. In hot weather cached prey quickly becomes unusable; Nelson (pers. comm.) observed a Peregrine retrieving and rejecting a stale food item. Stored prey in a New Zealand summer usually contained active fly larvae after 24 h and would become unpalatable to the falcons after about 48 h. Natural decay and infestation thus greatly limit the value of stored food for use during prolonged bad weather and encourages the theory that caches are used mostly for temporary drops in prey availablity. The Barred Owl *(Strix varia)* cache food early in the morning just before they stop hunting for the day. The stored food is retrieved in the early evening, before the main prey species have become really active or available (C.

M. White pers. comm.). Food storage may be more important for owls because they have no crops and because mammalian predators are less active during the daylight period when owl prey is in the cache.

The theory that caching has an adaptive advantage during periods of bad weather is an obvious but speculative one. R. W. Nelson (pers. comm.) considered that the Peregrine he studied had about 2–3 days' supply stored. This would be of especial use to this subspecies which lives in a wet and foggy climate. But caching may not be as advantageous as first appears; I found that hunting success with trained Northern Goshawks was, if anything, improved in rain, fog, wind, or falling snow. New Zealand Falcons retired to dry perches when it rained, but they would sally out if they saw a good attack opportunity. The small-bird prey species have a high metabolic requirement which takes a considerable portion of the day to satisfy, and they are thus extra vulnerable when out in the rain collecting insects or seeds. Prolonged bad weather could affect raptors by:

a. covering ground prey such as mice and lizards with a protective blanket of snow,
b. reducing prey populations to low levels owing to death or migration,
c. weakening some prey and making them more vulnerable,
d. covering hidden prey with snow (Snowy Owl, *Nyctea scandiaca,* sat on prey or carried it rather than caching it, in Wisconsin, [F. Hamerstrom pers. comm.]).

Thus caching may not have so much significance during prolonged winter weather as first thought.

It seems probable that the only reason food caching is prevalent in the New Zealand Falcon is that this species has evolved in the absence of mammalian predators capable of locating cached prey by scent. Now that cats, dogs, and mustelids have been introduced in New Zealand, food storage is probably less advantageous to New Zealand Falcons. On several occasions when falcons were at hack on the farm, our cat was seen actively to search for and raid the falcons' food stores, and a 20 m radius around one nest in the wild was completely rooted up by wild pigs *(Sus scrofa),* presumably searching for hidden falcon prey. Thus caching behavior in other parts of the world would have less adaptive benefit for falcons except perhaps when there is a pressure exerted on them to maintain a steady food supply during the breeding season.

The possible adaptive advantages of food caching may be sumarized as follows:

a. maintains food supplies during temporary low prey availability.
b. maintains food supply during irregular stress periods, e.g. bad weather.
c. may reduce parasite infections from prey.
d. may reduce nest predation.
e. acts as a stage in the development of the food pass during courtship.

In evolutionary terms food storage during the nonbreeding season may be relict behavior in most falcon species, or it may be that observations of the more wary falcon species have so far been inadequate. Shy falcons, especially in winter, may be reluctant to hide food if they know they are being watched.

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Figure 1.—New Zealand Falcon in act of retrieving cached food.